Chinese Mathematics: A Concise History. By Li Yan and Du Shiran (translated by John N. Crossley and Anthony W. C. Lun). Oxford (Clarendon). 1987. xiii + 290 pp. $50.00.

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With the appearance of the third volume of Joseph Needham's *Science and Civilisation in China* (1959), Western readers obtained a new awareness of traditional Chinese mathematical accomplishments. Needham, assisted by Wang Ling, described both chronologically and by topic the development of mathematics in traditional China. Prior to Needham and Wang's work, the main English-language reference on the subject was Y. Mikami's *Development of Mathematics in China and Japan* (1913), which was based mainly on 19th-century scholarship. Tantalized by Needham and Wang's revelations, many members of the non-Chinese-speaking mathematics community (this reviewer included) have anxiously awaited the appearance of a more detailed and analytic survey and discussion of traditional Chinese mathematics. For the time being, our anticipation has been satisfied by the publication of *Chinese Mathematics: A Concise History*. Originally written by Li Yan and Du Shiran in Chinese, the book has been translated into English by John Crossley of the mathematics faculty at Monash University and Anthony Lun, a lecturer at the Hong Kong Polytechnic. Collaborating with the surviving author, Du, Crossley and Lun have updated and annotated the original work to produce a fascinating study of the content and development of traditional Chinese mathematics.

For several decades during the first half of this century, Li Yan was perhaps the foremost researcher on the history and development of Chinese mathematics. Through his many publications he made enormous bibliographical contributions to the understanding of the subject. Just before his death in 1963, he collaborated with one of his students, Du Shiran, to produce a two-volume history of Chinese mathematics, *Chung-kuo ku tai shu hsüeh chien shih* (1963). Since that time, this book has remained one of the major Chinese-language references on the history of Chinese mathematics; now, finally, it is available in English. *Chinese Mathematics* chronologically surveys the development of mathematics in China from pre-Qin times (pre-221 B.C.) to the fall of the Qing dynasty (1911). The accomplishments during these 2000 years are reviewed and discussed in nine chapters. Two chapters, 7 and 9, examine the impact of Western mathematical and scientific thought on the indigenous Chinese scene. It is interesting to note that during the first period of Western intrusion (ca. 1580–1723), the first six books of Euclid found their way into China through the efforts of the Jesuit missionary Matteo Ricci, but it was not until 1851, during the second period of Western influence, that a complete copy of Euclid was available in the Celestial Empire. That the mandarin scholars found Euclid's deductive approach to mathematical thinking

interesting did not alter their traditional approach to the subject, which was basically algorithmic in nature.

Possessing an efficient decimal-based numeration system that encompassed fractions and computational algorithms dependent on the use of a set of rods and a counting board, the Chinese developed accurate root extraction procedures at a very early date. Actually, Horner's method was used in China at least 500 years before Horner was born. These procedures were extended by Chinese scholars to obtain solutions for higher degree equations. By the time of the Yuan dynasty (1271–1368), Chinese algebraic accomplishment far exceeded that of the West—procedures for solving systems of higher degree equations in several unknowns were available, foreshadowing Bézout's work by several centuries. Similarly, Chinese work in using higher order interpolation methods and solving systems of simultaneous congruences also exceeded European efforts by 500 years. Why, then, if Chinese mathematics was so advanced did it not continue to develop at a rapid rate? Scholars as early as the Warring States period of Chinese history (475–221 B.C.) reflected on the concept of limits—"A one foot-long stick, though half of it is taken away each day, cannot be exhausted in ten thousand generations"—and yet in the subsequent 2 millennia China did not develop a calculus. Why was this? While our authors do not supply answers to these questions, they do render sufficient information on societal and institutional influences on mathematics for the readers to draw their own conclusions. Indeed, the establishing of a societal setting including discussions of contemporary mathematics education procedures is an exceptional and valuable feature of this work. For the Chinese, mathematics was intrinsically tied to the well-being and functioning of the state—it had to help preserve the status quo, a status quo that subjugated the ruled to the rulers.

For the culturally naive, the history of Chinese mathematics is fraught with rhetorical pitfalls and a labyrinth of picturesque terminology with no clear mathematical content. Who would suspect that works bearing such titles as *Dream Pool Essays* (1086) or *Precious Mirror of Four Elements* (1303) are classics of Chinese algebraic thought? The authors and translators have admirably led the readers through this labyrinth to a new level of understanding and appreciation of early Chinese mathematical accomplishments. The original text has been updated and supplemented with discussions of such recent finds as a Han tomb topographical map unearthed in 1973 and ancient bamboo-strip books devoted to mathematics discovered in 1984. Informative appendixes on the Chinese language, books, dynastic chronologies, and Chinese history assist the reader in developing a necessary perspective. The book also contains a brief bibliography of Western-language (mostly English) sources on the history of China and its mathematics, although the publisher's claim that "references to all the available, relevant material written in Western languages" (back cover) are given is certainly questionable. Many illustrations and facsimiles enhance the textual discussions. Unfortunately, typographical errors abound: Fig. 1 on page 2 is upside down; illustrations on page 42 are reversed; etc. For a book of such scholarly quality and substantial cost, such

production errors are inexcusable. However, despite this blemish, the fact remains that *Chinese Mathematics: A Concise History* will be a treasure to any reader who wishes to learn about the development of traditional Chinese mathematics. It is extremely appropriate that the colors of the cover are red and gold, the Chinese colors of "good fortune." Indeed, it is our good fortune that this book is now available in English.